

LONDON  
SCHOOL of  
HYGIENE  
& TROPICAL  
MEDICINE



LSHTM Research Online

Jose, Arun Pulikkottil; Kondal, Dimple; Gupta, Priyanka; Maheshwari, Anuj; Kaushik, Aprajita; More, Arun; Patil, Mansi; Sharma, Meenakshi; Bhise, Mukund; Verma, Narsingh; +7 more... Mishra, Rajesh; Ganorkar, Sachin; Bhalla, Sandeep; Mukherjee, Tapan Kumar; Beaney, Thomas; Poulter, Neil R; Prabhakaran, Dorairaj; (2019) May Measurement Month 2017: an analysis of the blood pressure screening campaign results in India-South Asia. *European heart journal supplements : journal of the European Society of Cardiology*, 21 (Suppl). D59-D62. ISSN 1520-765X DOI: <https://doi.org/10.1093/eurheartj/suz056>

Downloaded from: <http://researchonline.lshtm.ac.uk/4653046/>

DOI: <https://doi.org/10.1093/eurheartj/suz056>

#### Usage Guidelines:

Please refer to usage guidelines at <http://researchonline.lshtm.ac.uk/policies.html> or alternatively contact [researchonline@lshtm.ac.uk](mailto:researchonline@lshtm.ac.uk).

Available under license: Creative Commons Attribution Non-commercial  
<http://creativecommons.org/licenses/by-nc/3.0/>

<https://researchonline.lshtm.ac.uk>

# May Measurement Month 2017: an analysis of the blood pressure screening campaign results in India—South Asia

Arun Pulikkottil Jose<sup>1</sup>, Dimple Kondal<sup>1</sup>, Priyanka Gupta<sup>1</sup>, Anuj Maheshwari<sup>2,3</sup>, Aprajita Kaushik<sup>1</sup>, Arun More<sup>4</sup>, Mansi Patil<sup>5</sup>, Meenakshi Sharma<sup>6</sup>, Mukund Bhise<sup>7</sup>, Narsingh Verma<sup>3,8</sup>, Rajesh Mishra<sup>1</sup>, Sachin Ganorkar<sup>3,9</sup>, Sandeep Bhalla<sup>1</sup>, Tapan Kumar Mukherjee<sup>10</sup>, Thomas Beaney<sup>11</sup>, Neil R. Poulter<sup>11</sup>, and Dorairaj Prabhakaran<sup>1,12,13\*</sup>

<sup>1</sup>Centre for Chronic Conditions and Injuries, Public Health Foundation of India, Plot 47, Sector 44, Gurugram, Haryana 122002, India;

<sup>2</sup>Department of General Medicine, Babu Banarasi Das University, Lucknow, Uttar Pradesh 226028, India;

<sup>3</sup>Indian Society of Hypertension, King George's Medical University, Shah Mina Rd, Chowk, Lucknow, Uttar Pradesh 226003, India;

<sup>4</sup>Rural Health Progress Trust, Murud, Maharashtra 413510, India;

<sup>5</sup>Indian Association of Parenteral and Enteral Nutrition - Pune Chapter, Pune, Maharashtra 411019, India;

<sup>6</sup>Indian Council of Medical Research, Ansari Nagar, New Delhi, Delhi 110029, India;

<sup>7</sup>Department of Community Medicine, Maharashtra Institute of Medical Science & Research, Vishwanathpuram, Ambajogai Road, Latur, Maharashtra 413531, India;

<sup>8</sup>Department of Physiology, King George's Medical University, Shah Mina Rd, Chowk, Lucknow, Uttar Pradesh 226003, India;

<sup>9</sup>Apollo Clinics India, Hyderabad, Telangana 500016, India;

<sup>10</sup>Kolkata Municipal Corporation, 5, S. N. Banerjee Road, Kolkata, West Bengal 700 013, India;

<sup>11</sup>Imperial Clinical Trials Unit, Imperial College London, Stadium House, 68 Wood Lane, London W12 7RH, UK;

<sup>12</sup>Centre for Chronic Disease Control, C-1/52, 2nd Floor, Safdarjung Development Area, New Delhi, Delhi 110016, India; and

<sup>13</sup>Department of Epidemiology, London School of Hygiene and Tropical Medicine, Keppel St, Bloomsbury, London WC1E 7HT, UK

Elevated blood pressure (BP) is a growing burden worldwide, leading to over 10 million deaths each year. May Measurement Month (MMM) is a global initiative aimed at raising awareness of high BP and to act as a temporary solution to the lack of screening programmes worldwide. A recently conducted study on 1.3 million adults in India showed the prevalence of hypertension to be 25.3%. Raised BP is responsible for 8.5% of the total Disability Adjusted Life Years and is also an important contributor to cardiovascular disease which is the leading cause of deaths in the country. An opportunistic cross-sectional survey of volunteers aged  $\geq 18$  was carried out in May 2017. Blood pressure measurement, the definition of hypertension and statistical analysis followed the standard MMM protocol. The study was conducted in over 500 screening sites across the country and involved over 5000 volunteers. Screening sites included health facilities such as hospitals and clinics, as well as a variety of public spaces. A total of 240 376 individuals were screened during MMM17. Out of the 122 685 screenees for whom all three BP readings were available, 38 974 (31.8%) had hypertension based on the mean of second and third reading. Of individuals not receiving antihypertensive medication, 21 679 (17.7%) were hypertensive. Of individuals receiving antihypertensive medication, 14 203 (82.6%) had uncontrolled BP. MMM17 was the largest collaborative BP screening campaign undertaken in India with involvement of the public as well as the private sector. Over two-thirds of the individuals on antihypertensive treatment had uncontrolled BP. Approximately one-fifth of the participants had raised BP and were not on antihypertensive treatment prior to the study. These results suggest that opportunistic screening can identify significant numbers with raised BP.

\*Corresponding author. Tel: +911244781400, Fax: +911244722971, Email: dprabhakaran@phfi.org

## Introduction

Raised blood pressure (BP) is an important and growing problem in India. According to a recent study of a nationally representative sample of 1.3 million adults in India, the crude prevalence of hypertension was found to be 25.3%.<sup>1</sup> A recent study by the Global Burden of Disease (GBD) study group shows that raised systolic BP is the fourth leading risk factor for Disability Adjusted Life Years (DALYs) in India and is responsible for 8.5% of the total DALYs.<sup>2</sup> As a contributing risk factor for cardiovascular disease and strokes, hypertension exerts considerable burden on the country's health system as well as on the national economy. It is estimated that 28% of mortality in India is due to cardiovascular disease, making it the leading cause of deaths.<sup>2</sup> It is estimated that 16% of ischaemic heart disease, 21% of peripheral vascular disease, 24% of acute myocardial infarctions, and 29% of strokes are attributed to hypertension in India.<sup>3</sup> High prevalence, coupled with low awareness and treatment levels, leads to high levels of uncontrolled BP in the community. Raising awareness regarding BP and improving detection rates through mass screening is an important and vital step in fighting this growing epidemic. The 'May Measurement Month' (MMM) campaign of the International Society of Hypertension is an initiative in this direction and leading organizations in the country took part in order to raise awareness regarding the silent killer.

## Methods

The study in India was conducted by multiple study coordinators considering its magnitude and widespread nature. Multiple groups were involved in the survey conducted in different regions of the country. The campaign was conducted in over 500 screening sites across India. Screening sites included hospitals, clinics, metro stations, residential colonies, villages, diagnostic laboratories, and offices. Institutional ethical clearance was taken from the respective Institutional Ethical Committees by all screening sites involved in the study.

Over 5000 volunteers and investigators were involved in the study. Volunteers were trained in BP measurement technique by site coordinators at the various screening sites. The study was conducted over a period of 31 days in the month of May 2017. Sreenees were recruited using the distribution of pamphlets, advertisements in online and print media, and advocacy on social media. BP was measured by both automated as well as manual sphygmomanometers.

All measurements were taken in a seated position. Investigators and volunteers were asked to take three measurements for each sreenee. Self-estimated weight and height were documented at most screening sites.

The Public Health Foundation of India created a web and mobile application for data collection and was enabled for offline capture of data. Data was cleaned and analysed locally by statisticians at the Public Health Foundation of India.

## Results

Data from 240 376 participants were cleaned, collated, and analysed. All the study participants were of South Asian ethnicity and the mean age was 39.5 years ( $SD \pm 15$ ;  $n = 139\,282$ ). More men ( $n = 129\,109$ ; 53.7%) than women took part in the study. Out of the 122 685 sreenees for whom all three BP readings were available, 38 974 (31.8%) had hypertension based on the mean of second and third reading or on history of anti-hypertensive medication. A total of 17 205 (14.0%,  $n = 122\,685$ ) participants were on anti-hypertensive treatment. Excluding participants taking antihypertensive medication, 21 769 (20.6%,  $n = 105\,480$ ) participants with hypertension were not receiving treatment. Among 17 205 participants who were receiving treatment for hypertension, 14 203 (82.6%) had uncontrolled BP. On analysis after exclusion of individuals who had history of antihypertensive treatment, there was no significant difference in mean systolic and diastolic BP between age groups and gender using linear mixed model. *Figure 1* shows significantly higher systolic and diastolic BP in people receiving antihypertensive drug after adjustment for age and sex. There is a significant increase in both systolic and diastolic BP with an increasing body mass index (*Figure 2*).

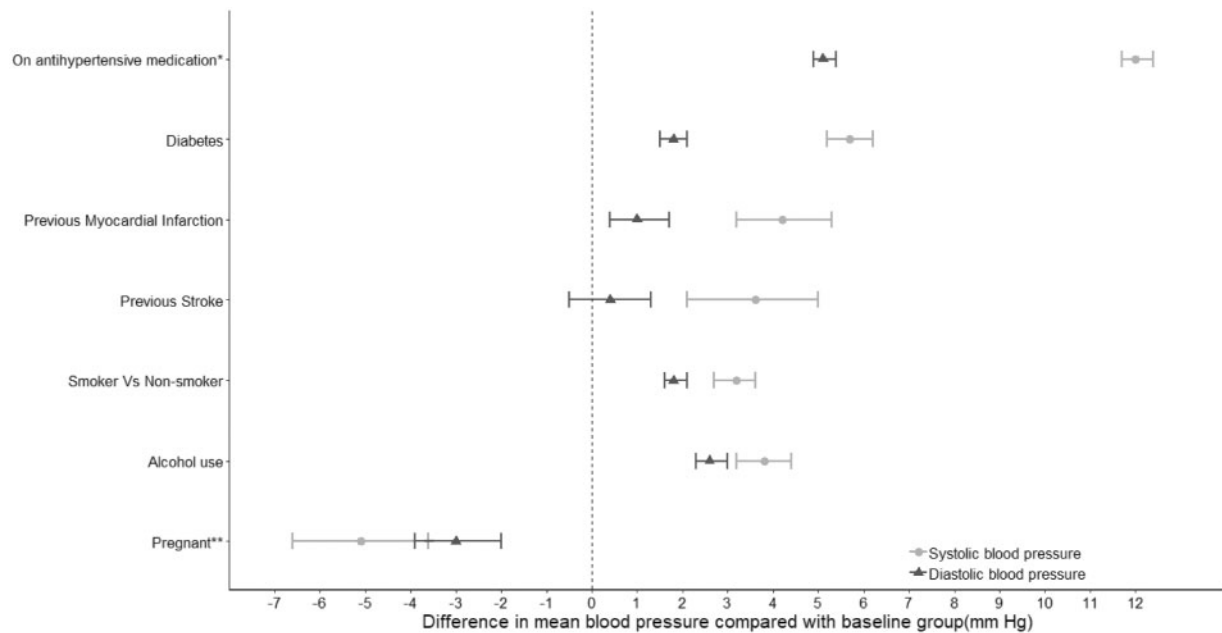
## Discussion

The MMM study in India was conducted with minimal preparation and mostly volunteer contributions. In a short period of 4 months, collaborations were forged, ethical clearances taken and screening sites set up. Despite the limitations, the study was able to screen almost a quarter of a million individuals. The study has set an example for future mass screening programmes in the country and is particularly relevant considering the recent Government of India initiative to conduct universal screening for diabetes, hypertension, and three common cancers (oral, breast, and cervical cancer).

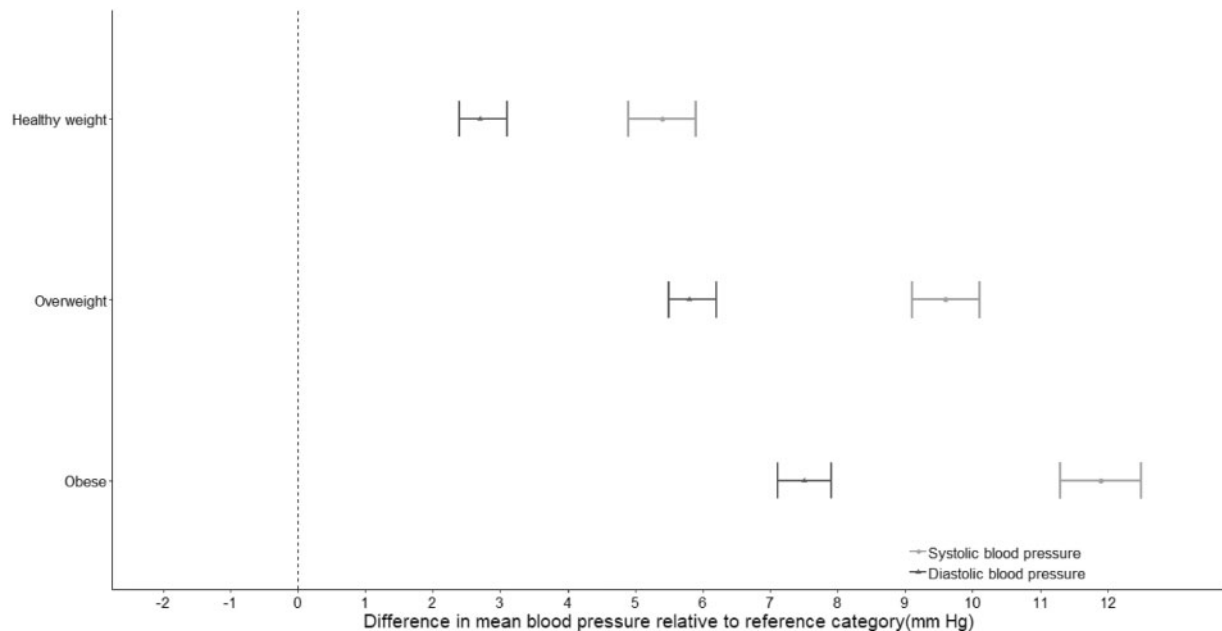
Approximately one-third of our study participants were found to have hypertension ( $\geq 140/90$  mmHg or on treatment for raised BP). Although the study was conducted using convenience sampling and it is inappropriate to compare with the true population prevalence, it is hard to ignore the similarity between the proportion of hypertensives in the study and the prevalence of hypertension in the nationally representative sample.<sup>1</sup>

Close to one-fifth of the participants had hypertension and were not on antihypertensive treatment prior to the study. It is also alarming that less than a fifth of those on antihypertensive treatment had their BP under control. Similar findings of low awareness level and poor control of BP among hypertensives has been reported by several studies in the past.<sup>4</sup>

Considering the high burden of hypertension and the low level of awareness among the general population, efforts such as MMM play a vital role in raising awareness, initiating preventive measures in the normal at-risk population, identifying hidden cases, and initiating



**Figure 1** Difference in mean blood pressure according to individual characteristics from linear mixed model adjusted for age, sex, and antihypertensive medication (except where annotated). \*Adjusted for age and sex. \*\*Adjusted for age and antihypertensive medication.



**Figure 2** Difference in mean blood pressure according to body mass index from linear mixed model, adjusted for age, sex, and antihypertensive medication, with underweight as the reference category.

non-pharmacological as well as pharmacological interventions in those with overt hypertension. In addition to the benefits at the population level, the campaign also plays an important role in improving the levels of opportunistic screening among physicians. Large nationwide studies such as the MMM are also vital in establishing networks between key players in the field of hypertension and lays the foundation for concerted efforts in the future.

### Acknowledgements

We thank all volunteer MMM staff and participants across all screening sites in India. The study would not have been possible without the efforts and invaluable contributions of the following individuals—Soumya Swaminathan, R.S. Dhaliwal, and Neeraj Chaudhary (Indian Council of Medical Research, New Delhi); K.K. Aggarwal (Indian Medical Association); Y.P. Munjal

(Association of Physicians of India); Velu Nair and Vijay Bhatti (Army Medical Corps); Atin Ghosh (Kolkata Municipal Corporation); Samar Banerjee, Bal Kishan Gupta, Shehla Sheikh, Divya Saxena, Vivek Agrawal, Jalees Fatma, Shailendra Vajpayee, A.K. Singh, Nikhil Gupta, and Arvind Gupta (Indian Society of Hypertension); Sharad Padule, Minu Spanada, and Ashish Gautam (Rural Health Progress Trust); Rushikesh Kharolkar (NCD Cell, Osmanabad); Anant Takalkar (MIMSR Medical College, Latur); Anand Kalme (PHC Kharola); Suman Kundu (University of Delhi); Sandra Albert (Indian Institute of Public Health–Shillong); Vishal Patil (Indian Association of Parenteral and Enteral Nutrition, Pune); S.K. Nanda (National Institute of Homeopathy); Narendra Nath V (Ramaiah Hospital); C. Shanthi (Madurai Medical Wing, Brahma Kumaris); Sulochana B (Manipal College of Nursing); Abhay Bang and Yogesh Kalkonde (Society for Education, Action and Research in Community Health); Sowmya Bhat (Father Muller Medical College); Bijender Dhillon (Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences, Rohtak); Neeru Kaushik (Maxim Merry School, Greater Mohali, Punjab); Parul Sinha, Sudhir Ranjan Samal, R.K. Ranjit, J.C. Sekhar and the team at the Public Health Foundation of India. Pushkar Kumar, Haresh Chandwani, Christopher Armstrong, Gina Sharma, Nikki Pandey, Anshika Sharma, Vishnu Nair,

Roopa Shivashankar, Prashant Jaryhan, Nikhil S V, and Ashok Aggarwal. We would also like to acknowledge the individual-level efforts of the thousands of physicians that contributed to the study.

## Funding

The MMM study in India was partly funded by an unrestricted educational grant from Torrent Pharmaceuticals Limited.

**Conflict of interest:** none declared.

## References

1. Geldsetzer P, Manne-Goehler J, Theilmann M, Davies JI, Awasthi A, Vollmer S, Jaacks LM, Bärnighausen T, Atun R. Diabetes and hypertension in India: a nationally representative study of 1.3 million adults. *Intern Med* 2018;**178**:363-372.
2. India State-Level Disease Burden Initiative Collaborators. Nations within a nation: variations in epidemiological transition across the states of India, 1990-2016 in the Global Burden of Disease Study. *Lancet* 2017;**390**:2437-2460.
3. Mohan S, Reddy KS, Prabhakaran D. *Chronic Non-communicable Diseases in India-Reversing the Tide*. New Delhi: Public Health Foundation of India; 2011; Report; NCDs.
4. Anchala R, Kannuri NK, Pant H, Khan H, Franco OH, Di Angelantonio E, Prabhakaran D. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. *J Hypertens* 2014;**32**:1170-1177.